FINAL REPORT

Utilization and Expenditures in a State-sponsored Drug Benefit Program for the Elderly

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Executive Summary

This study addresses three different issues regarding outpatient drug benefits for the elderly: 1) prescription drug utilization and expenditures by elderly persons (age 65 years or older); 2) the incidence of potential drug/drug interactions in this population; and 3) sample sizes needed to study drug utilization in a population of elderly recipients.

This research analyzed claims data for 418,341 prescription drug recipients enrolled in the State of Pennsylvania's Pharmaceutical Assistance Contract for the Elderly (PACE) program during the period of July 1, 1987 through June 30, 1988. PACE enrollees not having a prescription claim during the study year were not included in the study population. Prescription drug utilization and expenditure data were extrapolated to annual estimates and analyzed by demographics and therapeutic categories. Drug/drug interactions (DDI's) were analyzed by specific interaction and demographic characteristics. Sample size estimates were calculated using a point estimation approach and power calculations for analysis of variance hypotheses testing.

Major study findings are:

- Using annualized usual and customary prescription drug charges, the percent of PACE recipients estimated to reach a $600 deductible in 1991 ranged from 30.2 percent to 45.1 percent depending upon the rate of induced demanded and inflation assumed. At an annual inflation rate of nine percent, the range would be 41.0 percent to 44.0 percent of recipients (35.9 to 38.5 percent of enrollees). To reach a limit of no more than 16.8 percent of recipients meeting the deductible, it is estimated that the deductible should be set at between $1200 and $1350 depending on the induced demand and inflation factors considered.

- The mean prescription claims per recipient was 27.04 and the mean annualized usual and customary charge equalled $547.49. Nursing home residents received an average of 35.88 claims with mean annual charges of $654.18. White recipients and female recipients were responsible for most of the PACE prescription utilization and expenditures.

- Cardiovascular agents were the major therapeutic category responsible for most of the charges with 42 percent of the total at an average annual charge of $229.82 In terms of specific therapeutic categories, average annual charges were $45.89 per recipient for anti-ulcer agents and $44.36 for non-steroidal antiinflammatory agents.

- During the study period 131,339 recipients had the potential for a drug/drug interaction for an incidence rate of 314 per 1000 recipients. Of the approximately 11.1 million prescription claims evaluated, 1.3 million, about twelve percent, showed the potential for interaction with the recipient's concomitant drug therapy. Approximately 26 percent of the potential interactions were termed "significant."

- Of the 20 medications involved most frequently in drug/drug interactions, approximately 40 percent were cardiovascular agents. Six of the 20 most frequent "significant" interactions involved beta blocker agents.

- Sample size estimates show that depending upon the acceptable error, an adequate sample size for this population could range from approximately 5,000 to 40,000 recipients.

This study is only a reflection of persons receiving pharmaceutical benefits under the PACE program and is not generalizable to the United States population of elderly persons. However, if Medicare beneficiaries would have behaved similarly to the study population, utilization of pharmaceuticals provided under the Medicare Catastrophic Coverage Act would have been underestimated and the program would have been underfunded without the implementation of major cost containment strategies by the Secretary of the Department of Health and Human Services. Also, these results illustrate that more patient information other than a drug/drug interaction alert must be available for pharmacists to make educated decisions regarding the potentiality and severity of drug/drug interactions.

Introduction

With the passage and subsequent repeal of the Medicare Catastrophic Coverage Act (MCCA), much attention has been directed toward the utilization and expenditures for the elderly's prescription drugs. Because of several factors, the funding mechanism, the use of a deductible to restrict patient eligibility for the MCCA outpatient drug benefit, and the proposed drug utilization review program, it became even more important to lessen the uncertainty of potential drug utilization and expenditures by the elderly.

This study addresses concerns related to three different aspects of the MCCA drug benefit. First, prescription drug utilization and expenditures by the elderly (age 65 years or over) are examined. Second, the incidence of drug/drug interactions in this population are studied. Third, sample sizes needed to study drug utilization in a population of elderly prescription drug recipients.

Background Information

Prescription drug utilization and expenditures-- Estimating the number and percentage of Medicare beneficiaries who would have been eligible for MCCA outpatient drug benefits is important because it is directly related to potential program costs. However, such estimates have been difficult to accurately project for several reasons. Data bases used for projections have been fraught with problems such as timeliness of the data and survey methods employed to collect the data. The use of different data bases by researchers makes comparisons of the estimates difficult. Also, little knowledge about the "induced demand" effect of insurance or Medicare beneficiaries potential use of the benefit complicates the estimation process.

Considering these problems, it is useful to consider the projections regarding prescription drug utilization and their evolution. The House of Representatives version of the MCCA included a deductible of $500. Using different assumptions and data bases the Congressional Budget Office (CBO) and the Health Care Financing Administration (HCFA) estimated that 18.4 percent and 28.7 percent, respectively, of the Medicare enrollees would exceed the $500 deductible. A study performed by Project Hope compared these estimates and concluded that HCFA estimates were probably more accurate because of a more reliable data base and an assumption of an increasing trend in drug use (Wilensky, Neumann, and Blumberg, 9/9/87).

When MCCA was voted out of the Committee on Conference in May 1988, the deductible had been changed. The deductible was set at $550 in 1990, $600 in 1991, $652 in 1992, and calculated so that 16.8 percent of eligible beneficiaries would satisfy the deductible requirement after 1992. During November 1988 HCFA staff prepared estimates that showed the drug program would be insolvent by the end of 1991, and that 25 percent of Medicare beneficiaries would meet the deductible. HCFA maintained that instead of a $600 deductible in 1991 it should have been set at $1005 (F-D-C Reports, 11/28/88).

In April 1989, Pharmaceutical Data Services (PDS) reported that outpatient drug expenditures under MCCA would not be as large as earlier predicted. PDS found that only 14.8 percent of Medicare-eligible patients had drug costs greater than $600 during a twelve-month period (F-D-C Reports, 4/17/89).

In early 1989, the 1987 National Medical Expenditures Survey (NMES) became available for administration and congressional staff to use in revising their estimates. HCFA's revised estimates were released in May 1989 and predicted that by deflating the $600 deductible to 1987 dollars, 19.6 percent of noninstitutionalized Medicare beneficiaries would have met the deductible (F-D-C Reports, 5/15/89). In July 1989 the Congressional Budget Office released its report based on the NMES data. CBO estimated that 26 to 27 percent of Medicare enrollees would meet the deductible in 1991 and 1992. They also suggested that to ensure 16.8 percent of the enrollees would meet the deductible in 1993, it would have to be increased to $1100 (F-D-C Reports, 7/17/89).

As different members of Congress offered compromise legislation in an attempt to prevent MCCA's repeal, the deductibles used in those proposals continued to increase. There is little doubt that the uncertainty surrounding the number of Medicare beneficiaries who would meet the deductible as well as the corresponding drug benefit cost estimates created considerable concern within Congress and eventually contributed to the act's repeal. The first objective of this research is to provide more information on the utilization and expenditures of prescription drugs in the elderly population.

Drug utilization review and drug/drug interactions--The MCCA legislation included a provision which would assist in assuring appropriate prescribing and dispensing of drugs for Medicare beneficiaries. This would be accomplished by identifying unnecessary and inappropriate prescribing of outpatient drugs, substandard care with respect to drugs, and

potential adverse drug reactions. The conferees expected that pharmacists would perform these functions prior to dispensing prescription pharmaceuticals. This drug utilization review (DUR) program was considered by some, including the American Association of Retired Persons, to be one of the more important aspects of the legislation. Department of Health and Human Services Inspector General Harold Kusserow maintained that "...the congressional mandate to establish a Medicare DUR program presents a significant opportunity to design and operate a multi-level system to improve quality of care, avoid unnecessary Medicare and personal expenditures, and maintain program integrity" (Office of the Inspector General, 1/6/89).

An important part of the DUR program would have been a prospective review of each patient's drug therapy by the pharmacist to check for potential drug/drug interactions. HCFA decided the best way to provide this information for the pharmacist was through the use of a point-of-sale (POS) claims processing system in each participating pharmacy. HCFA directed potential claims processors to establish and maintain a drug interaction file to detect "potentially severe drug interactions" which are "predictable, well documented and of great potential harm...." HCFA estimated that this would include approximately 225 to 250 drug/drug interactions although modifications and/or additions were expected (Health Care Financing Administration, July 1989).

Critics of HCFA's proposal maintained that the drug/drug interactions list was not comprehensive, the products were too old, and too few of the products were used by the elderly. In a report reviewing the adequacy of the HCFA's DUR system, the Government Accounting Office (GAO) maintained HCFA's list of drug/drug interactions omitted some categories of "clinically important drug interactions" and was based on the most serious interactions in the general population and not the geriatric population (F-D-C Reports, 7/24/89).

Due to the controversy over which drug/drug interactions should be included in a DUR program for Medicare beneficiaries, a second objective of this study is to examine the incidence of interactions in an elderly population. The incidence of potentially severe interactions is examined as well as the most frequent drug/drug interactions.

Sample size estimates--Provider audits for monitoring compliance with program guidelines are important to any insurance program. They also serve as a deterrent to noncompliant behavior among participants. Pharmacies are usually chosen for audits by one of two methods. First, exception profiling involves selecting pharmacies which fall

outside predefined parameters (for example, number of Medicaid prescriptions or average payment per recipient). The second method is to audit a random sample of pharmacies.

HCFA personnel stated at one time that they were committed to auditing all participating pharmacies, 25 percent of the pharmacies per year (F-D-C Reports, 11/28/88). Later, in their request for proposal (RFP) for drug claim processing, HCFA stated that each claims processor would be required to audit 7.5 percent of participating pharmacies annually. The RFP required the claims processor to review a "statistically valid sample" of bills paid to the pharmacy provider over a specified period of time. The sample would be selected based upon sampling parameters provided by HCFA (Health Care Financing Administration, July 1989).

The third objective of this study is to provide sampling estimates for an elderly population using the population parameters and varying power levels. These results should provide more direction towards the sampling requirements for prescription audits.

Study Methodology

Definition of terms and variables--In order to adequately understand the remainder of this report it is important to define several terms and variables to be used.

-**Elderly person**: one who is of age 65 or older.

-**Enrollee**: refers to any person who was enrolled in the State of Pennsylvania's Pharmaceutical Assistance Contract for the Elderly (PACE) program during the study period.

-**Recipient**: refers to any PACE enrollee who had at least one claim for a prescription drug during the study year.

-**Claim**: used for provider reimbursement for a service rendered and includes information from a prescription; it may be considered to be analogous to a new prescription or a refill.

Prescription claim reimbursements were analyzed using different variables:

-**Mean amount paid**: the average amount actually paid by the PACE program for each PACE recipient's prescriptions during the study period. This variable excludes a $4.00 copayment per prescription paid by the recipient.

-Mean amount paid plus $4.00: the average amount paid by the PACE program for each PACE recipient. It includes the $4.00 copayment per prescription.

-Mean usual and customary charge: the average dollar amount pharmacies would have charged PACE recipients for their prescriptions received during the study period if the recipients would have paid directly out-of-pocket, i.e., the amount billed by the provider.

-Mean usual and customary charge minus $4.00: refers to the usual and customary charge minus a $4.00 copayment per prescription.

-Mean annualized usual and customary charge: the mean usual and customary charge extrapolated to 365 days if the recipient was enrolled in the PACE program less than 365 days during the year. If the recipient was enrolled in PACE during the entire year, mean annualized usual and customary charge would equal the mean usual and customary charge.

Several terms regarding this study of drug/drug interactions (DDI's) warrant defining. The DDI's were classified as "significant" or "moderately significant". DDI's were classified using a retail pharmacy computer system from the perspective of what a pharmacist should do when confronted with such an interaction. Therefore,

-Significant DDI: signifies a very important interaction and notification of the prescriber is recommended before the pharmacist dispenses the medication.

-Moderately significant DDI: signifies a somewhat less threatening clinical situation than the "significant" DDI and the pharmacist should consider whether or not the prescriber should be contacted before dispensing the medication.

The number of PACE recipients who had potential drug/drug interactions (DDI's) because of concurrent drug use during the study period was based on the number of unique DDI's occurring per person. The grand totals may reflect the same person being counted twice; however, the numbers for specific interactions are the numbers of PACE recipients with the potential for that specific DDI occurring. In other words, the specific DDI totals sum to the grand total and a person may have the potential for more than one specific DDI during the study period. The number of potential interactions during the year is also determined. A person may have the potential for the same DDI to occur several times during the year. Each of these potential interactions count toward the total for the specific DDI. A different view of this is that the number of

interactions would be the number of times an original prescription and its refills are dispensed and a DDI may occur if the potential incident is not detected and action is not taken to remove or change one of the interacting pharmaceutical therapies.

Study population--The study population consists of those persons enrolled in the Commonwealth of Pennsylvania's Pharmaceutical Assistance Contract for the Elderly (PACE) program. This program's purpose is to assist elderly Pennsylvania residents pay for out-of-hospital pharmaceutical therapy. The program began July 1, 1984 and is administered by Pennsylvania's Department of Aging. It is financed by revenue derived from the state lottery.

Eligibility for PACE benefits is limited to Pennsylvania residents who are 65 years of age or older and who have annual incomes of less than $12,000 if single or $15,000 for a married couple. Persons receiving Medicaid benefits are ineligible for PACE. The program provides reimbursement to providers for dispensing prescription-only drugs, insulin, and insulin syringes. Prescriptions for capsule and tablet dosage forms are limited to a 30-day supply or 100 doses of therapy, whichever is less. There is no limit to the number of prescriptions for which PACE will reimburse during a specific time period. Cost-sharing by the PACE beneficiary occurs through a $4.00 copayment per prescription. During the study period, pharmacies were reimbursed the lower of their usual and customary charge to the general public or the average wholesale price (AWP) plus a $2.75 dispensing fee. The $4.00 copayment is subtracted from the "lower of" price.

This study is based on a census of prescription claims data for the 477,772 enrollees in the PACE program during the time period from July 1, 1987 through June 30, 1988. The only criterion for a person to be included in the study population was to have been eligible for PACE benefits at some time during the year. Of the 477,772 enrollees, 36,459 had no PACE prescription claims during the year. Because of the possibility that many of these persons were getting their prescriptions through other payment mechanisms (e.g., Medigap insurance policies, direct expenditures for prescription costs below or near the $4.00 copayment, local government programs), they were omitted from the study population. The reduced study population consisted of 441,313 PACE recipients. Of this total, 22,972 persons were omitted due to the data requirements of the design and procedures of the study. Therefore, the final study population consisted of 418,341 PACE benefit recipients.

Demographic data for the final study population is presented in Table 1. Approximately 74 percent of the population is female and 91 percent is white. Only about 3 percent lived at some time during the year in a nursing home facility. It has been reported that PACE enrollees are older and more likely to be female and widowed than the population of all elderly in Pennsylvania. In addition, because of the program's income restrictions, the average enrollee's income is less than the income of the average elderly Pennsylvania resident. (Stuart, November 1989)

Data description--Data used in this research are from PACE program prescription claims generated and maintained by the program's claims processor, The Computer Company. Data are from two different computer files: (1) PACE Enrollee Eligibility File, and (2) PACE Prescription Claims File.

The Eligibility File contains the demographic and eligibility data for each enrollee. Although it also contains information such as enrollee identification number, name, and address, this information was not collected to assure confidentiality of the beneficiaries. An unique identification number was assigned for each enrollee in both files and was used as the linkage between the two data files. The Claims File contains records for each prescription claim processed. These data include prescription information such as the National Drug Code of the drug, quantity, and days supply dispensed. It also includes data regarding the usual and customary charge and the amount reimbursed the provider for the prescription. All data collected from the two files are listed in Appendix A.

Data base development--The objective of the data base development was to produce summary data files. This was necessary considering data from 11,133,290 claims were collected making it prohibitive in terms of computer time and costs to analyze each claim in every analysis. It was decided to create a summary data base for prescription utilization and expenditures as well as a second summary data base for drug/drug interactions. Each record on both summary files was recipient specific and included demographic data for that recipient. Figure 1 presents a flow chart of the data base development process.

The initial task was to merge the demographic data from the Eligibility File with summary data derived by analyzing data from the Claims File. The summary utilization and expenditure variables were computed for grand totals and also by major and specific therapeutic categories. Therapeutic categories were determined using the QS/1 pharmacy computer

system which matched National Drug Codes with a corresponding therapeutic category. The listing of therapeutic categories is presented in Appendix B. This task produced the Claims Summary File consisting of 418,341 records sorted by the unique enrollee identification number.

The purpose of the second data base development task was to create the Drug/Drug Interaction (DDI) Summary File. The initial step was to sort the Claims File by recipient identification number and date of dispensing and examine the file for prescription medications being taken concurrently by each PACE recipient. This was accomplished by examining the date of dispensing for each prescription claim and adding the number of days supply to determine the hypothetical date the drug therapy ended. This date was compared with the dispensing dates for the subsequent claims until the therapy ending date was less than the dispensing date of a later claim. The drug/drug interaction screening program was once again used to determine if potential drug/drug interactions may have occurred between the drugs in the initial claim examined and those on later claims which were dispensed concurrently. This process was continued for each claim in each recipient's profile of drug claims. Each occurrence of a drug/drug interaction (DDI) was output to a DDI File which contained the recipient identification number and the specific DDI. These data were used to create a DDI Summary File. Each record on this file consisted of the recipient number and one interaction along with the frequency of the interaction for that recipient. Demographic data from the Claims Summary File were merged with each record by matching with the recipient number.

Utilization, expenditure, and drug/drug interaction data analyses--Descriptive analyses were performed to gain a better understanding of the utilization and expenditures for prescription drugs dispensed for by PACE recipients. For each recipient, the utilization and expenditure variables were annualized to adjust for those recipients who were not eligible during the entire study year. This was performed by the following equation:

$$ANN = 365/NDAYS \times UNANN$$

where ANN is the annualized data, NDAYS is the number of days enrolled in PACE during the study year, and UNANN is the unannualized data.

In determining the percent of the PACE recipients who would have met various deductible levels in 1991, the first year of full Medicare Catastrophic outpatient drug benefits, sensitivity analyses were performed to provide a range of

estimates. The sensitivity analyses varied for different inflation rates from 1988 to 1991. Also considered was the induced demand which may have occurred with PACE but not MCCA drug benefits considering there was no deductible in the PACE program to be met. The formula used was:

$$ADJ91 = (UNADJ88 \times INFL) - (UNADJ88 \times IND)$$

where ADJ91 is adjusted data for the year 1991, UNADJ88 is the unadjusted data from 1988, INFL is the inflation rate compounded annually from 1988 to 1991, and IND is the induced demand factor.

The frequency of drug/drug interactions in this population was also examined. Incidence by specific drug/drug interaction was determined for every 1000 persons and for every 1000 prescription claims. For all analyses, results also were tabulated by demographic variables.

Sample determination analysis-- In order to estimate sample sizes from the population, the traditional point estimation approach was used to estimate a population mean. Sample sizes were also calculated using power calculations for analysis of variance hypotheses testing.

The first method used was a sample size determination for estimating population means. To calculate sample size by this method, four steps are followed: (Sudman, 1976)

1) In absolute terms, determine the level of error (e) which is acceptable. In this study the following error terms were used:
   a) For mean number of prescription claims per PACE recipient, every 0.25 increment in the number of prescriptions over a relevant range;
   b) For the mean expenditure per recipient, every $5.00 increment in expenditures was considered. In other words, determining the sample size needed to detect a $5.00, $10.00, $15.00, $20.00, etc., difference was computed
   c) For the mean price per prescription per recipient, differences of $0.25 intervals to be detected over a relevant range were calculated
2) Determine a Z value by selecting an alpha (α) value. In this research, a 95% confidence level or $Z = \pm 1.96$ was assumed ($\alpha=0.05$).
3) Determine the standard deviation from the population (σ). This standard deviation was calculated from the PACE data for each variable.

4) Calculate the sample size using the following formula:

$$n=\left[Z\frac{\sigma}{e}\right]^2$$

Two methods researchers generally use to increase power (1-ß) are to either increase the size of the sample or to apply an experimental design that provides a more precise estimate of treatment effects and a smaller error term. This analysis reverses these two conditions and asks: Given a certain level of power, and knowing the population standard deviation, what sample sizes are needed to detect various treatment effects? The precision of the design used and the impact of that design on sample size can then be considered.

Using the second method involving power calculations, five factors must be considered to determine the sample size necessary for testing a statistical hypothesis: (Kirk, 1968)

1) Minimum treatment effects the researcher is interested in detecting ($\mu_1-\mu_0$). This is equivalent to using the standard error (e) in the previous method.
2) Number of treatment levels (k). For convenience, this analysis will consider two levels for independent measures when using the power calculation for analysis of variance.
3) Population standard deviation (σ). This is calculated from the PACE population data for each variable.
4) Probability of a type I error, or alpha (α). For this research, alpha was set at 0.05.
5) Probability of a type II error, or Beta (ß). Beta values ranged from 0.4 to 0.01 for this research.

The power calculations were conducted using a method developed by Tang. In all cases, it was assumed that observations were normally distributed with a common error variance. Using Tang's method, the parameter (ϕ) is defined as: (Tang, 1938)

$$\phi=\frac{\sqrt{\sum_1^k(\mu_j-\mu)^2/k}}{\sigma_\epsilon/\sqrt{n}}$$

After determining ϕ, the sample sizes necessary to achieve the designated powers were determined by using power function tables (Pearson and Hartley, 1951).

Study Caveats--Possible study limitations are related to the data collected and the assumptions made. First, because this study is an examination of prescription drug utilization and expenditures for a population of elderly in one state, it is not possible to generalize the findings of this research to all elderly. Not only is the study population geographically distinct but also the availability of publically-funded drug benefits probably has some effect on their utilization, leaving the representativeness of the population in question.

Another possible limitation is that 36,459 of the 477,772 enrollees (approximately 7.6 percent), had no PACE prescription claims during the study year and were omitted from the study. The important question here becomes why were there no PACE claims for these people. If these persons did not receive any outpatient prescription drug therapy through any source during the study year, then their omission will cause the findings to be overstated. However, if a significant number of these persons were receiving prescription drug therapy but claims were not submitted for them, including the persons with no claims would be understating the findings. Also, it has been observed that there are a large number of new applications to the PACE program during the last two weeks of a fiscal year which would inflate the number of non-users during that year (Stuart and Ahern, 1989). An interesting possibility is that no matter what the public drug benefit might be, PACE or Medicare Catastrophic, there may be similar segments of the population who would not file for benefits. Because of the uncertainty involved, the decision was made to view this research as a study of PACE drug benefit recipients. A similar problem was that for 22,972 recipients, eligibility information was not available to the researchers. Because data were annualized, it was necessary to have eligibility and ineligibility dates. These persons were also omitted from the study. Post hoc analyses of unannualized variables show that there appeared to be very little difference after these persons were included or excluded from the study population (Mean Number of Claims: Including--25.216, Excluding--25.219; Mean Annual Usual and Customary Charges: Including--$508.12, Excluding--$508.91).

Another possible influence on the results may have been the annualization of the utilization and expenditure data. The key factor here is that there were some recipients who died during the study year who should not have had their data annualized. In any program, especially those which provide services to the elderly, there will be a certain amount of mortality among the beneficiaries. However, because mortality information was not available it was not possible to identify deceased recipients and exclude them from the annualization process. Therefore, adjusting the expenditures of decedents would overstate utilization and expenditures. However, other

factors, such as PACE enrollees have a lower utilization rate during their first months of eligibility (Stuart and Ahern, 1989), may lead to an understatement of utilization and, therefore, somewhat offset the error in annualizing decedent data. Post hoc analyses showed that 352,593 or 84.3 percent of the 418,341 recipients were eligible during the entire study period. Persons eligible the entire year had an average of 27.27 claims and $550.01 in total usual and customary charges compared with the 27.04 annualized claims used by all recipients and their $547.49 in total charges. Regarding the distribution of total charges, 16.2 percent of the recipients eligible the entire year had charges greater than $1000 while 16.0 percent of all recipients had annualized charges greater than $1000. Also, 34.7 percent of those eligible the entire year had charges greater than $600 as did 34.2 percent of all recipients. Therefore, persons who were eligible the entire year had greater utilization and charges than the persons who had their data annualized. This is somewhat surprising if these persons were in their last months of life since it would be expected that their utilization would be greater. A possibility is that these recipients may have been hospitalized for a period of time before death and were receiving their drug therapy in an inpatient hospital setting and not through the PACE program.

As previously stated, because of the PACE program's prescription copayment some prescriptions (i.e., those less than or approximately $4.00) which were dispensed for program enrollees were not filed as claims. This could be a factor in understanding demand. However, the Medicare Catastrophic legislation provided for 20 percent coinsurance per prescription and based on the average prescription price of $19.74, this would have produced a mean coinsurance payment of $3.95. Therefore, the possible effect of the copayment and the coinsurance on demand may have been similar. It would be interesting to determine if a coinsurance type plan versus copayments would result in requests by recipients to dispense more lower-cost drug products in order to decrease their cost-sharing.

There are also limitations related to the analysis of drug/drug interactions (DDI) which should be considered. First, the determination of concurrent prescriptions may not be totally accurate. Because recipients may not have been compliant with their therapy regimen, more or less prescriptions may have been concurrently used depending upon whether dosages were taken early or were missed. In addition, some therapy may have been discontinued for various reasons. Second, the determination of DDI's was only potential and not actual. It is not possible to determine whether or not hypothesized DDI's actually occurred. Third, the incidence and number of DDI's found may differ from that of other

research because the DDI screening program used in this study also included what may be viewed as "therapeutic contraindications" and not only drug/drug interactions.

Finally, a limitation to the sample size determinations is that all dependent measures were based on per recipient data. This does not permit sample determinations of certain types, for example, number of PACE claims in the population to be audited to give an adequate sample of all claims. Calculations in this research are person specific and give numbers of persons needed for samples. For the purpose of this study, it was assumed that the data were normally distributed. While it is recognized that population values are not normally distributed, by the central limit theorem we assume that the sampling distributions would be normal.

Results

Prescription utilization and expenditures--Results of the mean annual expenditures by various variables and their distributions are presented in Tables 2 through 6. The results which may be most pertinent are those in Tables 5 and 6 which represent usual and customary charges and annualized usual and customary charges, respectively. Data in Table 6 show that during the study year the average annual usual and customary charges per recipient was approximately $547 in 1988 dollars. In 1988, 34.2 percent of the PACE recipients and 30.0 percent of total enrollees would have reached a $600 deductible. In order to meet the requirement that only 16.8 percent of the recipients meet the deductible, a deductible of approximately $975 would have been necessary. The deductible for 16.8 percent of total enrollees would have been approximately $900.

Tables 7 through 11 present results regarding the percent of recipients who would have met various deductible levels in 1991 when inflation and induced demand are considered. Data in Table 7 show that an estimated 30.2 to 46.0 percent of the recipients would have met a $600 deductible in 1991. This would correspond to 26.5 to 40.3 percent of the enrollees. If the trend of nine percent inflation for pharmaceuticals should continue, the range of estimates would be narrowed to 41.0 to 44.0 percent of recipients or 35.9 to 38.5 percent of enrollees. In order to meet a requirement of 16.8 percent of recipients reaching the deductible, a $1175 to $1275 deductible would be required assuming nine percent inflation. To reach 16.8 percent of enrollees, a deductible of $1075 to $1175 would be needed.

Utilization and expenditures tabulated by demographic variables are presented in Tables 12 through 13 and are summarized in Table 14. The mean annualized claims per recipient was 27.04, and the mean annualized usual and customary charge equalled $547.49. Per enrollee, the mean annualized claims were 23.68 and the mean annualized usual and customary charge was $479.38 Whites and females are responsible for more of the PACE prescription claims and expenditures on average than other groups. Widows and persons married but living separately also are responsible on average for more claims and expenditures than the other groups. Nursing home residents have considerably more utilization and expenditures than the average with almost 36 claims per recipient and about $654 in mean annualized usual and customary charges. In regard to age, average utilization and expenditures seem to peek in the 76 through 85 age category. Use and charges by total income does not vary greatly across the classifications although there does seem to be lower utilization and usual and customary charges in the lower income classification of $0 to $5000. In terms of comparing the amount of utilization and expenditures to the percent of the population each demographic classification represents, there appears to be only minor differences between the percentages. On a percentage basis, the most obvious difference is with nursing home residents. Although they represent only 3.4 percent of the population, they were responsible for about 4.5 percent of the claims. This is about 32 percent greater than the percent of the population.

Utilization and expenditures by therapeutic categories are presented in Tables 15 through 16. It can be seen in Table 15 and Figure 2 that the major therapeutic category most commonly dispensed and responsible for the most expenditures is the cardiovasculars. However, the highest average charge per prescription was for gastrointestinal agents with a per prescription charge of $34.33 as compared with the overall average of $19.74. Table 16 contains results for more specific therapeutic categories. There were more drug claims for diuretics than any other category with an average of 2.54 per person. Although the average number of claims for anti-ulcer agents was only 0.98, this category had the largest average annual usual and customary charge of almost $46. This was due to the highest average prescription charge which was $46.20 for the anti-ulcer products. Antilipemic agents had an average prescription charge of almost $39 while cephalosporin antibiotics, non-steroidal antiinflammatory agents and calcium-channel blockers each had average prescription charges of over $30.

Drug/drug interactions--The results from the analysis of drug/drug interactions (DDI's) are presented in Tables 17 through 23. The number of PACE recipients with potential DDI's occurring during the study period is shown in Table 17. The totals include some persons more than once if they would have had more than one DDI during the year. Post hoc analyses showed that during the study period 131,339 recipients had the potential for a DDI. This produces an incidence rate of 314 per 1000 recipients.

Approximately 26 percent of the interactions found were termed "significant." Of the 20 most frequent significant interactions, six DDI's involved beta blockers. Another four interactions involving beta blockers were found on the list of "moderately significant" DDI's. However, results indicate that more persons were affected by interactions involving nonsteroidal antiinflammatory drugs (NSAID's) and thiazide diuretics than by beta blockers (Table 18). Most of the total NSAID and thiazide interactions were denoted as being "moderately significant." Figure 3 illustrates that of the top 20 drugs involved in DDI's, 40 percent were cardiovascular agents with another 20 percent being central nervous system agents.

Table 19 indicates the actual number of times interactions would have been detected using the QS/1 pharmacy computer system. Almost 1.3 million of the approximately 11.1 million PACE claims, or about 12 percent of the total claims showed some type of interaction with another drug. The rankings in terms of frequency changed somewhat from the number of recipients findings but the top five in each significance category remained fairly stable.

The percent of drug/drug interactions by demographic variables are presented in Tables 20 through 23. The drug/drug interactions listed in these tables are the ten significant interactions affecting the most recipients (from Table 17). The percent of recipients with potential interactions occurring among different racial and income classifications showed very few differences. Females had somewhat more interactions than the percent of the population they represented. Also, nursing home recipients represented 4.5 percent of the population with a potential DDI during the study period but they made up only 3.4 percent of the total population.

Sample size determinations--Three dependent measures were used to demonstrate sample size calculations: 1) the mean number of PACE claims per recipient; 2) the mean annual usual and customary expenditure per recipient; and 3) the mean usual and customary expenditure per prescription per recipient. The research question to be answered is how many subjects do we need to sample in order to detect a specified difference in either the number of claims, the mean annual expenditure, or the mean expenditure per recipient.

Results of sample size determinations using the point estimation procedures are presented in Table 24. The effect that different standard deviations have on sample size calculations can be seen. As the standard deviation (σ) or alpha (α) increases by a factor of k, the sample size increases by a factor of k^2. Likewise, as the acceptable error (e) is reduced by a factor of k, the sample size required to detect the same difference increases by a factor of k^2. As the sample size grew very large it was also necessary to apply a finite population correction term since the population of subjects was limited. These calculations show that the sample size could greatly vary according to the dependent measure. Depending upon the acceptable error, an adequate sample size could range from 5,000 to approximately 40,000 members.

Figures 4 through 6 indicate the sample sizes needed in order to detect various levels of differences between means using α=0.05 and varying power levels. The case presented here is the simplest one where only two groups are used (k=2) and the minimum treatment effect is equal in each group. In this case when α=0.05 and the power is 0.8 the equation yields the same result as the point estimation procedure. In Figures 4-6, the power curves of 0.8 give the same result as the point estimation procedure.

Discussion

Prescription Utilization and Expenditures

Results presented here indicate that estimates by HCFA and CBO as to the number of Medicare beneficiaries who would have met a $600 deductible level appear to be low. Although this research mainly focusses upon utilization of recipients and not total enrollees and cannot be generalized to all Medicare beneficiaries, it is feasible that the percentage meeting a $600 deductible in 1991 would have been over 30 percent.

Findings from the analysis of utilization and expenditures by demographic variables produced few surprises. It has been generally accepted that females utilize more prescriptions than males and that nursing home residents have higher utilization of prescription drugs than their noninstitutionalized counterparts. An interesting finding is that persons in the $0 to $5000 income group had lower utilization and expenditures than those recipients with greater incomes. There is a possibility that these persons received assistance from other sources or became eligible for Medicaid during the study period. Without controlling for each of the other variables, one should be hesitant in making general conclusions from the demographic information presented here.

The results presented by therapeutic categories reinforced the knowledge of the large amount of utilization of cardiovascular agents by the elderly. If a Medicare outpatient drug benefit resurfaces it may be necessary for the financial viability of the program to restrict payment for selected therapeutic categories. Because of their chronic and widespread use, cardiovascular drug therapy may be a good candidate for such a benefit. It is also apparent that some drug therapy, such as antiulcer agents and antilipemics, could cause problems in terms of their costs to such a program. However, one must not only consider the costs of these therapies without also estimating the benefits resulting from these agents.

Drug/Drug Interactions

Results from the drug/drug interaction (DDI) analysis are difficult to interpret without controlling for demographic variables and, possibly more important, the number of PACE claims. With this in mind, it is apparent that a large number of elderly have the potential for DDI's to occur.

Although this examination of potential DDI's in an elderly population presents results which suggest a problem, a closer look at the results must be taken for two reasons: (1) idiosyncracies in the particular DDI detection system being used, and (2) the need for a more stringent evaluation of a recipient's therapy regimen beyond the interacting medications.

In the first instance, many computerized DDI detection programs group different drug entities into a common therapeutic category. Only certain members of the category may exhibit the potential for a particular DDI but because of the classification process, all entities in the category are implicated. In this study two such groups were the quinolone antiinfectives and the nonsteroidal antiinflammatory drugs (NSAID's). In the situation of the NSAID's, the drug entity of most concern is phenylbutazone because of its potentially significant interaction with oral anticoagulants and with thiazide diuretics (a moderately significant interaction). However, because the use of phenylbutazone has been greatly diminished by the use of other NSAID's which do not have the potential for these DDI's, the number of interactions involving NSAID's are probably overstated. In regard to DDI's involving the quinolone antiinfectives, only certain drug entities in this category interact with theophylline and to varying degrees. Nalidixic acid does not interact with theophylline while norfloxacin appears to cause less of a problem than does ciprofloxacin (McEvoy, 1990).

Regarding the second factor, in many instances the entire drug therapy regimen of a person must be reviewed before the potential for a DDI can be determined. As an example, the most frequent significant DDI found was between ACE Inhibitors and Potassium salts. Because ACE Inhibitors may themselves increase potassium levels, use of potassium supplements would exacerbate the problem. However, considering this study population, concomitant therapy may have also included a thiazide diuretic which would result in potassium excretion, thereby decreasing the probability of adverse effects. Other examples of interactions include digitalis/furosemide and digitalis/thiazides in which the potential for DDI's would be lessened if potassium supplements were used. In addition, there may also be therapeutic contraindications which are represented as DDI's in this study. For example, the

utilization of beta blockers may generally be less effective than other hypotensive agents in the elderly population. If the beta blocker is being used for hypertension, then other therapies, such as diuretics or calcium channel blockers might be preferred therapy. Otherwise, if beta blockers are used after a myocardial infarction with resulting significant cardiac failure, there is the possibility that digoxin is already being used to increase cardiac output and the beta blocker may not be indicated. These types of problems may be encountered if only drug/drug interactions are reported and no information regarding other concomitant therapy is available to the pharmacist.

Previous research reported that approximately 17 percent of a sample of PACE enrollees received one or more pairs of interacting prescription drugs (Ahern, 1987). Although this research found approximately 31 percent had the potential for a drug/drug interaction, the discrepancy may be due to the factors discussed above. However, because of the potential implication on the use of other Medicare services it is important to consider the therapeutic contraindications previously discussed.

Sample Size Determinations

By using the population parameters of subjects who were recipients in the PACE program, these sample size calculations may be used as approximations for determining sample sizes in other projects that use similar populations or whose populations have similar variances. It is recognized that these sample sizes may not be exact, but may be more precise than other procedures, e.g., Range/6 to estimate the populations standard deviation. Small differences in estimated parameters used for sample size determination can make large differences in the calculated sample size.

In using the three analyses presented in Figures 4 through 6, several results should be of interest. First, by using these charts we can develop a "feel" for the correct sample size that should be used depending on the seriousness of a type II error if we hold the α level constant. This should allow selection of a conservative sample size that will appropriately answer the research question. A second advantage of these graphs is that they allow visualization of the slope of the curve as minimum treatment effects change. We can tell how sensitive the required sample size is to treatment effect size changes over the range of interest. Again, this may allow a more conservative choice of sample size given the rate of change in the curve. If the rate is changing rapidly, a larger sample could be justified.

Conclusions

Prescription Utilization and Expenditures

Findings indicate that more Medicare recipients may have met the originally proposed $600 deductible for catastrophic drug benefits than had been previously suggested. If as these results indicate, over 40 percent of the recipients (or over 35 percent of the total enrollees) would have been receiving the benefits, the drug trust fund would have become insolvent within a few years without forceful cost-containment measures by Congress or the Secretary. The administrative difficulties that this unanticipated utilization might have had on the claims processing system may have brought about significant problems with providers and beneficiaries.

There is need for a demonstration project(s) which would help to determine the drug utilization of Medicare enrollees and the effect of induced demand on utilization. Possibly more important would be to examine the effect of providing drug benefits on the utilization of other Medicare benefits. This is especially critical because the MCCA drug benefits as passed by Congress would have been paid from a drug benefit trust fund, yet potential benefits of decreased costs of other services may have been seen in other Medicare funds.

Drug/Drug Interactions

The effect on Medicare expenditures as a result of the utilization of DDI-induced physician services and hospitalizations may be significant. It is important to determine if a point-of-sale computer system, such as that included in the Medicare Catastrophic Coverage Act drug benefit, or any other retail pharmacy computer system with a drug/drug interaction program can affect the incidence of DDI's. Pharmacists should view these systems as tools to help them provide a higher quality of care for their patients. However, the possibility that almost one out of every eight prescriptions would have resulted in a DDI alert might produce a problem for the pharmacist in terms of the time needed to make a valid clinical decision for each potential DDI.

Also, the results suggest that only providing DDI information may not be enough to make a valid clinical decision regarding their importance. Because more information about the patient's drug regimen and patient history is needed to determine the potentiality and significance of an interaction, providing this information should be considered.

Finally, when considering the use of different drug/drug interaction screening programs, it is important to understand the therapeutic groupings of drugs because of its implications for the detection of potential interactions. Equally important is to consider whether the screens are for only drug/drug interactions or also include potential therapeutic contraindications.

Important issues for future research are to determine the number and incidence of DDI's which cause episodes requiring medical care and the extent of that care. Also, the incidence of DDI's compared with the number of prescriptions for the drug entity involved in the interaction needs to be studied to provide a better evaluation of those drugs of most concern.

Sample Size Determination

In most sample size determinations, the population error variance is unknown. In this research we have calculated the population error variance for these data. These results should be compared with another population of claims to determine how stable these variances are for pharmaceutical claims. If they are stable, then these calculations may be consistent for many types of claims research where subjects are being sampled. In future studies with this data base a more exact sample size can be used, and in other research based on similar patient populations, the sample size calculations from this population may serve as a guide. In any case, these estimates provide better sample size estimates than most approximations of population error variance.

In retrospect, it is possible to evaluate the sample sizes of many studies that have already been conducted and observe how they compare. With the availability of large data bases there may be a tendency to oversample which may not be the most efficient use of resources. For example, if a sample size is off the curve for the given treatment effect of interest, considerably more computer resources may be used than is necessary and trivial differences may be statistically significant.

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APPENDIX A

Table A.1

Data collected from PACE claims files

Eligibility File	Claims File
Unique Identification No.	Unique Identification No.
Race	Provider Number
Gender	Prescription Number
Marital Status	National Drug Code
Type of Residence	Quantity Dispensed
Age	Days Supply Dispensed
Date of Birth	Date Dispensed
County of Residence	Amount Billed
Income	Amount Paid
Third-party Liability	Date Paid
Eligibility Date(s)	
Ineligibility Date(s)	

A P P E N D I X B

Table B.1

Therapeutic Categories

Antibiotics

- Penicillins
- Tetracyclines
- Erythromycins
- Cephalosporins
- Other Antibiotics
- Sulfonamides
- Miscellaneous Antibiotics

Central Nervous System Agents

- Analgesics and Antipyretics
- Anticonvulsants
- Sedatives And Hypnotics
- Tranquilizers
- Skeletal Muscle Relaxants
- Autonomic Drugs
- Antidepressants
- Nonsteroidal Antiinflammatory Drugs
- Miscellaneous Central Nervous System Agents

Cardiovascular Agents

- Cardiotonic Glycosides And Antiarrhythmics
- Hypotensives
- Diuretics
- Vasodilators
- Drugs For Gout Treatment
- Potassium Supplements
- Potassium Removing Resins
- Ammonia Detoxicants
- Calcium Channel Blockers
- ACE Inhibitors
- Antilipemic Agents
- Beta Blockers
- Miscellaneous Cardiovascular Agents

Hormones And Enzymes

- Adrenal Cortical Hormone
- Oral Contraceptive Combinations
- Thyroid And Antithyroid Preparations
- Estrogens And Progestogens
- Antidiabetic Agents
- Enzymes
- Anabolic Hormones And Androgens
- Miscellaneous Hormones And Enzymes

Table B.1-continued

Therapeutic Categories

Blood formation and Coagulation/Vitamins

- Anticoagulants
- Prescription Only Vitamins
- Prescription Only Multivitamins
- Hemostatics
- Dietary Supplements
- OTC Multivitamins

Gastrointestinal Agents

- Antiemetics And Emetics
- Antidiarrheals
- Antacids
- Digestants
- Antiulcer Agents
- Miscellaneous Gastrointestinal Agents (Includes Laxatives)

Miscellaneous Anti-Infectives

- Antifungals
- Urinary Germicides
- Antituberculars
- Amebacides And Anthelmintics
- Antivirals
- Other Miscellaneous Anti-Infectives

Miscellaneous Agents

- Antihistamines
- Eye, Ear, Nose, And Throat Agents Not Listed Elsewhere
- Heavy Metal Antagonists
- Spasmolytics
- Cough and Expectorant Preparations
- Antineoplastics
- Diagnostic Agents
- Prescription Devices
- Topical Corticosteroids
- Miscellaneous Skin and Mucous Membranes
- Miscellaneous Agents

FIGURES

Figure 1
Data Base Development

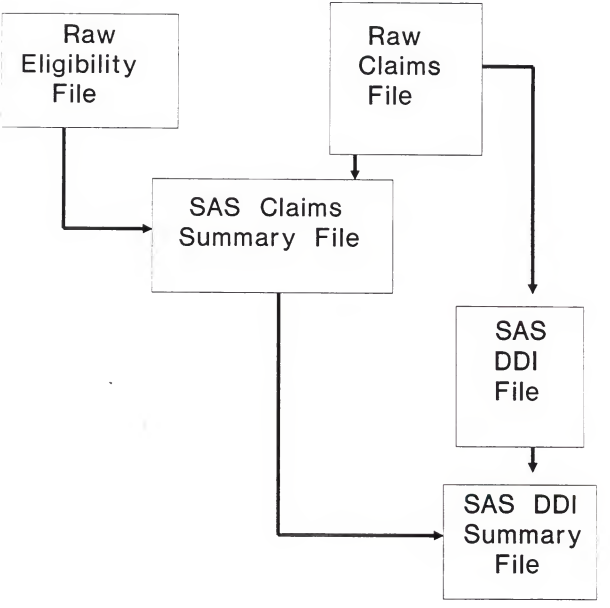
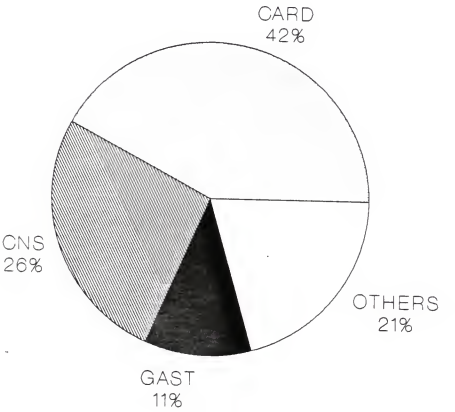
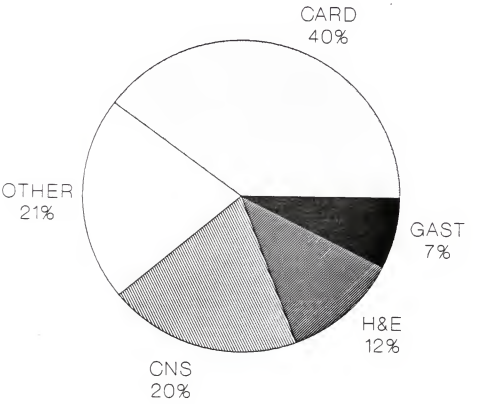


Figure 2
Percent of PACE Charges by Major Therapeutic Category



CNS is central nervous system agents, CARD is cardiovascular agents, GAST is gastrointestinal agents.

Figure 3
Therapeutic Categories Involved in Drug/Drug Interactions



CNS is Central Nervous System, GAST is Gastrointestinal, H&E is Hormones and Enzymes, and CARD is Cardiovascular.

Figure 4
Sample Size Calculations
Number of Claims per Person

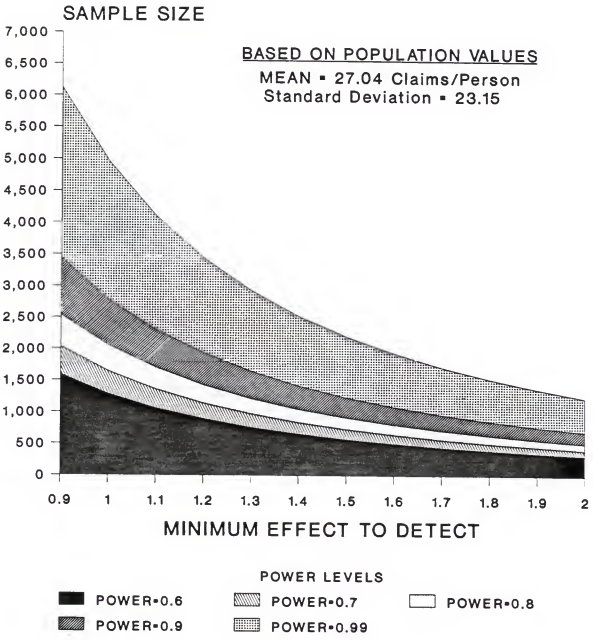


Figure 5
Sample Size Calculations
Charge per PACE Claim per Person

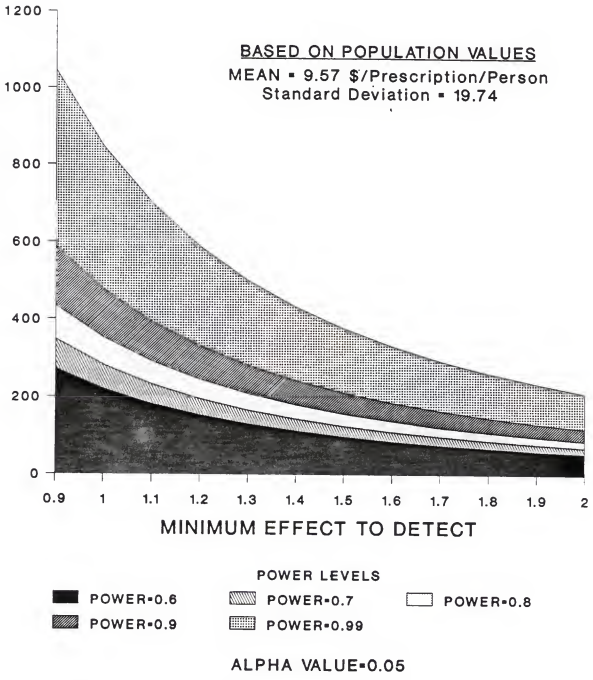
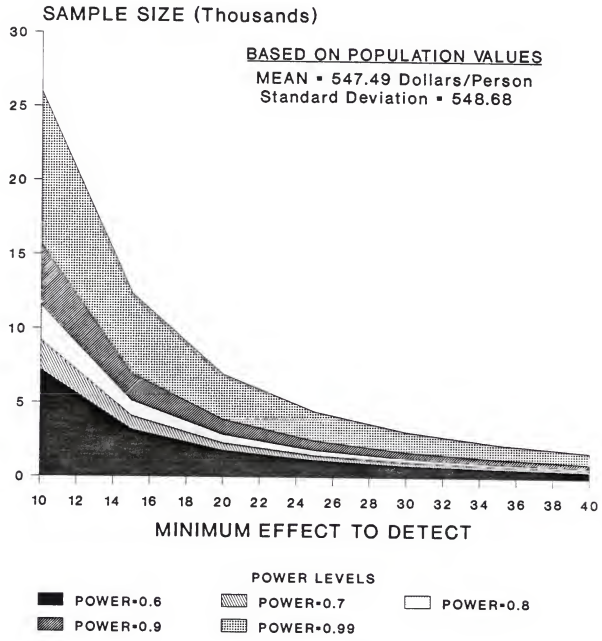


Figure 6
Sample Size Calculations
Annual PACE Charges per Person



T A B L E S

Table 1
Recipient Summary by Demographic Variables

Demographics	Number (n=418,341)	Percent of Recipients
Race		
White	381,180	91.12
Black	24,695	5.90
Am. Indian	2,002	0.48
Hispanic	506	0.12
Asian	347	0.08
Other races	64	0.02
Unknown	9,547	2.28
Gender		
Female	307,835	73.58
Male	110,506	26.42
Marital status		
Widow	232,842	55.66
Married	124,389	29.73
Single	41,848	10.00
Divorced	13,213	3.16
Married, living separately	6,046	1.45
Unknown	3	0.00
Type residence		
Property owner	317,745	75.95
Apartment	39,887	9.53
Nursing home	14,277	3.41
Boarding resident	5,545	1.33
Other	35,079	8.39
Unknown	5,808	1.39
Age		
65-70	101,549	24.27
71-75	104,853	25.06
76-80	96,690	23.11
81-85	66,828	15.97
86-90	33,845	8.09
91-95	12,096	2.89
96-100	2,078	0.50
Unknown	402	0.10
Income ($)		
0-2,500	19,583	4.68
2,501-5,000	43,539	10.41
5,001-7,500	126,981	30.11
7,501-10,000	103,514	24.74
10,001-12,500	76,401	18.26
12,500-15,000	47,375	11.32
Unknown	1,948	0.47

Table 2

Number and percent of PACE recipients[1] and enrollees[2] with mean amount paid[3], by level of expenditure: Fiscal year 1987-1988

Expenditure Level	Total Recipients	Expenditure Per Recipient		Percent Meeting Expenditure Level	
		Mean	Standard Deviation	Recipients[4]	Enrollees[5]
Total	418,341	$383.6	$412.9	100.0	87.6
$500 or more	115,723	913.3	419.2	27.7	24.2
$600 or more	91,098	1,012.0	421.0	21.8	19.1
$700 or more	71,448	1,112.1	423.5	17.1	15.0
$800 or more	55,922	1,213.1	426.5	13.4	11.7
$900 or more	43,778	1,314.3	430.1	10.5	9.2
$1000 or more	34,271	1,415.9	434.2	8.2	7.2
$1100 or more	26,815	1,518.2	438.9	6.4	5.6
$1200 or more	21,060	1,619.4	444.2	5.0	4.4
$1300 or more	16,512	1,721.6	450.6	4.0	3.5
$1400 or more	13,006	1,822.3	458.1	3.1	2.7

[1]Recipients are persons enrolled in the PACE program who had at least one prescription claim submitted during the year (n=418,341).
[2]Enrollees are persons eligible for PACE benefits during the year (n=477,772).
[3]Amount paid is the annual prescription dollar amount paid by the PACE program per recipient. It does not include a $4.00 copayment per prescription claim paid by the recipient.
[4]Number of recipients in expenditure level divided by 418,341 (total recipients).
[5]Number of recipients in expenditure level divided by 477,772 (total enrollees).

Table 3

Number and percent of PACE recipients[1] and enrollees[2] with mean amount paid plus $4.00[3] by level of expenditure: Fiscal year 1987-1988

Expenditure Level	Total Recipients	Expenditure Per Recipient		Percent Meeting Expenditure Level	
		Mean	Standard Deviation	Recipients[4]	Enrollees[5]
Total	418,341	$484.5	$492.2	100.0	87.6
$500 or more	151,393	988.5	484.3	36.2	31.7
$600 or more	123,927	1,086.0	483.7	29.6	25.9
$700 or more	101,578	1,182.3	483.6	24.3	21.3
$800 or more	82,906	1,280.0	484.1	19.8	17.4
$900 or more	67,408	1,379.2	485.2	16.1	14.1
$1000 or more	54,672	1,479.6	486.6	13.1	11.4
$1100 or more	44,448	1,578.8	488.3	10.6	9.3
$1200 or more	36,096	1,678.4	490.5	8.6	7.6
$1300 or more	29,222	1,779.6	493.2	7.0	6.1
$1400 or more	23,703	1,880.1	496.2	5.7	5.0

[1]Recipients are persons enrolled in the PACE program who had at least one prescription claim submitted during the year (n=418,341).
[2]Enrollees are persons eligible for PACE benefits during the year (n=477,772).
[3]Amount paid plus $4.00 is the annual prescription dollar amount paid by the PACE program per recipient. These data include a $4.00 copayment per prescription claim paid by the recipient.
[4]Number of recipients in expenditure level divided by 418,341 (total recipients).
[5]Number of recipients in expenditure level divided by 477,772 (total enrollees).

Table 4

Number and percent of PACE recipients[1] and enrollees[2] with mean usual and customary charge minus $4.00 copayment[3], by level of expenditure: Fiscal year 1987-1988

Expenditure Level	Total Recipients	Expenditure Per Recipient		Percent Meeting Expenditure Level	
		Mean	Standard Deviation	Recipients[4]	Enrollees[5]
Total	418,341	$408.0	$438.7	100.0	87.6
$500 or more	124,027	939.3	446.8	29.6	25.9
$600 or more	99,141	1,037.4	448.9	23.7	20.8
$700 or more	78,826	1,137.7	451.9	18.8	16.5
$800 or more	62,689	1,238.0	455.4	15.0	13.1
$900 or more	49,687	1,340.0	459.7	11.9	10.4
$1000 or more	39,445	1,441.8	464.4	9.4	8.3
$1100 or more	31,346	1,543.5	469.9	7.5	6.6
$1200 or more	24,875	1,646.5	476.1	5.9	5.2
$1300 or more	19,796	1,748.8	483.0	4.7	4.1
$1400 or more	15,769	1,851.1	491.1	3.8	3.3

[1]Recipients are persons enrolled in the PACE program who had at least one prescription claim submitted during the year (n=418,341).
[2]Enrollees are persons eligible for PACE benefits during the year (n=477,772).
[3]Usual and customary charge minus copayment is the annual prescription dollar amount billed the PACE program per recipient. It does not include a $4.00 copayment per prescription claim paid by the recipient.
[4]Number of recipients in expenditure level divided by 418,341 (total recipients).
[5]Number of recipients in expenditure level divided by 477,772 (total enrollees).

Table 5

Number and percent of PACE recipients[1] and enrollees[2] with mean usual and customary charge[3] by level of expenditure: Fiscal year 1987-1988

Expenditure Level	Total Recipients	Expenditure Per Recipient		Percent Meeting Expenditure Level	
		Mean	Standard Deviation	Recipients[4]	Enrollees[5]
Total	418,341	$508.9	$517.7	100.0	87.6
$500 or more	158,611	1014.2	511.2	37.9	33.2
$600 or more	131,132	1111.7	510.9	31.4	27.5
$700 or more	108,552	1208.1	511.1	26.0	22.7
$800 or more	89,503	1305.9	511.9	21.4	18.7
$900 or more	73,577	1405.0	513.3	17.6	15.4
$1000 or more	60,404	1504.5	515.3	14.4	12.6
$1100 or more	49,533	1604.6	517.5	11.8	10.4
$1200 or more	40,678	1703.9	520.4	9.7	8.5
$1300 or more	33,254	1805.8	523.7	7.8	6.7
$1400 or more	27,248	1906.6	527.4	6.5	5.7

[1]Recipients are persons enrolled in the PACE program who had at least one prescription claim submitted during the year (n=418,341).
[2]Enrollees are persons eligible for PACE benefits during the year (n=477,772).
[3]Usual and customary charge is the annual prescription dollar amount billed the PACE program per recipient. This variable most closely resembles a pharmacy's usual and customary charge to private-pay patients. These data include a $4.00 copayment per prescription claim paid by the recipient.
[4]Number of recipients in expenditure level divided by 418,341 (total recipients).
[5]Recipients in Expenditure Level divided by 477,772 (total enrollees).

Table 6

Number and percent of PACE recipients[1] and enrollees[2] with mean annualized usual and customary charge[3], by level of expenditure: Fiscal year 1987-1988

Expenditure Level	Total Recipients	Expenditure Per Recipient		Percent Meeting Expenditure Level	
		Mean	Standard Deviation	Recipients[4]	Enrollees[5]
Total	418,341	$547.5	$548.7	100.0	87.6
$500 or more	172,242	1,027.0	557.0	41.2	36.1
$600 or more	143,109	1,124.4	563.2	34.2	30.0
$700 or more	118,852	1,221.5	571.1	28.4	24.9
$800 or more	98,373	1,320.0	581.0	23.5	20.6
$900 or more	81,136	1,420.2	593.1	19.4	17.0
$1000 or more	66,807	1,521.3	607.6	16.0	14.0
$1100 or more	54,951	1,623.4	624.4	13.1	11.5
$1200 or more	45,326	1,724.2	643.8	10.8	9.5
$1300 or more	37,168	1,828.7	666.8	8.9	7.8
$1400 or more	30,579	1,932.2	692.7	7.3	6.4

[1]Recipients are persons enrolled in the PACE program who had at least one prescription claim submitted during the year (n=418,341).
[2]Enrollees are persons eligible for PACE benefits during the year (n=477,772).
[3]Usual and customary charge is the prescription dollar amount billed the PACE program per recipient. These data include a $4.00 copayment per prescription claim paid by the recipient and are annualized to 365 days eligible during the year, for each recipient.
[4]Number of recipients in expenditure level divided by 418,341 (total recipients).
[5]Number of recipients in expenditure level divided by 477,772 (total enrollees).

Table 7

Percent of PACE recipients meeting $600 expenditure level: 1991 projections

Induced Demand Factor[1]	Annual Inflation Factor[2]					
	0%	7%	8%	9%	10%	11%
0.0%	34.2	42.0	43.0	44.0	45.1	46.0
1.0%	33.8	41.7	42.7	43.7	44.8	45.8
2.5%	33.2	41.2	42.2	43.3	44.3	45.4
5.0%	32.3	40.4	41.5	42.5	43.6	44.7
7.5%	31.2	39.6	40.7	41.8	42.9	44.0
10.0%	30.2	38.7	39.9	41.0	42.1	43.2

[1]The induced demand factor is used to deflate each recipient's expenditure because of induction which would have occurred in this population with no deductible.
[2]The annual inflation factor is used to inflate the data on a compounded basis from 1988 to 1991.

NOTE: PACE study population equalled 418,341. These data are calculated using the annualized usual and customary charges.

Table 8

Percent of PACE recipients meeting $800 expenditure level: 1991 Projections

Induced Demand Factor[1]	Annual Inflation Factor[2]					
	0%	7%	8%	9%	10%	11%
0.0%	23.5	31.0	32.0	33.1	34.1	35.2
1.0%	23.1	30.7	31.7	32.8	33.9	34.9
2.5%	22.6	30.2	31.3	32.4	33.4	34.5
5.0%	21.7	29.4	30.5	31.6	32.7	33.8
7.5%	20.7	28.6	29.7	30.8	31.9	33.0
10.0%	19.8	27.8	28.9	30.1	31.2	32.3

[1]The induced demand factor is used to deflate each recipient's expenditure because of induction which would have occurred in this population with no deductible.
[2]The annual inflation factor is used to inflate the data on a compounded basis from 1988 to 1991.

NOTE: PACE' study population equalled 418,341. These data are calculated using the annualized usual and customary charges.

Table 9

Percent of PACE recipients meeting $1000 expenditure level: 1991 projections

Induced Demand Factor[1]	Annual Inflation Factor[2]					
	0%	7%	8%	9%	10%	11%
0.0%	16.0	22.8	23.8	24.8	25.8	26.8
1.0%	15.7	22.5	23.5	24.5	25.5	26.5
2.5%	15.2	22.1	23.1	24.1	25.1	26.1
5.0%	14.4	21.3	22.3	23.4	24.4	25.4
7.5%	13.6	20.6	21.6	22.7	23.7	24.7
10.0%	12.9	19.8	20.8	21.9	23.0	24.0

[1]The induced demand factor is used to deflate each recipient's expenditure because of induction which would have occurred in this population with no deductible.
[2]The annual inflation factor is used to inflate the data on a compounded basis from 1988 to 1991.

NOTE: PACE study population equalled 418,341. These data are calculated using the annualized usual and customary charges.

Table 10

Percent of PACE recipients meeting $1200 expenditure level: 1991 projections

Induced Demand Factor[1]	Annual Inflation Factor[2]					
	0%	7%	8%	9%	10%	11%
0.0%	10.8	16.6	17.5	18.4	19.3	20.3
1.0%	10.6	16.4	17.2	18.2	19.1	20.0
2.5%	10.2	16.0	16.9	17.8	18.7	19.6
5.0%	9.6	15.3	16.2	17.1	18.1	19.0
7.5%	8.9	14.7	15.5	16.5	17.4	18.4
10.0%	8.3	14.0	14.9	15.8	16.8	17.7

[1]The induced demand factor is used to deflate each recipient's expenditure because of induction which would have occurred in this population with no deductible.
[2]The annual inflation factor is used to inflate the data on a compounded basis from 1988 to 1991.

NOTE: PACE study population equalled 418,341. These data are calculated using the annualized usual and customary charges.

Table 11

Percent of PACE recipients meeting $1400 expenditure level: 1991 projections

Induced Demand Factor[1]	Annual Inflation Factor[2]					
	0%	7%	8%	9%	10%	11%
0.0%	7.3	12.1	12.8	13.6	14.4	15.2
1.0%	7.1	11.9	12.6	13.4	14.2	15.0
2.5%	6.8	11.6	12.3	13.1	13.9	14.7
5.0%	6.3	11.0	11.8	12.5	13.3	14.1
7.5%	5.8	10.5	11.2	12.0	12.8	13.6
10.0%	5.4	9.9	10.7	11.5	12.2	13.0

[1]The induced demand factor is used to deflate each recipient's expenditure because of induction which would have occurred in this population with no deductible.
[2]The annual inflation factor is used to inflate the data on a compounded basis from 1988 to 1991.

NOTE: PACE study population equalled 418,341. These data are calculated using the annualized usual and customary charges.

Table 12

Annualized number of PACE prescription claims by recipient demographics

Demographics	Mean number of claims (SD)	Total number of claims	Percent of total
Race			
White	27.28 (23.33)	10,398,557	91.91
Black	24.33 (20.62)	600,929	5.31
Am. Indian	26.11 (22.69)	52,265	0.46
Hispanic	23.23 (20.86)	11,756	0.10
Asian	21.90 (18.93)	7,598	0.07
Other races	22.01 (15.53)	1,408	0.01
Unknown	25.28 (22.02)	241,375	2.13
Gender			
Female	27.58 (23.07)	8,489,644	75.04
Male	25.56 (23.30)	2,824,246	24.96
Marital status			
Widow	27.97 (23.23)	6,513,329	57.57
Married	25.99 (23.36)	3,233,083	28.58
Single	25.17 (21.73)	1,053,242	9.31
Divorced	26.35 (22.70)	348,175	3.08
Married, Liv. Sep.	27.46 (24.33)	166,029	1.47
Unknown	10.33 (2.08)	31	0.00

NOTE: The number of PACE prescription claims are annualized to 365 days eligible for each recipient.

Table 12-continued

Annualized number of PACE prescription claims by recipient demographics

Demographics	Mean number of claims (SD)	Total number of claims	Percent of total
Type residence			
Private home	26.36 (22.64)	8,375,023	74.02
Apartment	28.54 (23.57)	1,138,493	10.06
Nursing home	35.88 (28.83)	512,292	4.53
Boarding home	31.16 (25.61)	172,792	1.53
Other	27.50 (23.50)	964,651	8.53
Unknown	25.94 (22.22)	150,636	1.33
Age			
65-70	26.14 (24.05)	2,654,365	23.46
71-75	26.82 (23.15)	2,812,301	24.86
76-80	27.57 (22.86)	2,665,690	23.56
81-85	28.02 (22.76)	1,872,224	16.55
86-90	27.62 (22.46)	934,714	8.26
91-95	26.01 (21.85)	314,645	2.78
96-100	24.06 (20.33)	49,997	0.44
Unknown	24.75 (20.48)	9,951	0.09

NOTE: The number of PACE prescription claims are annualized to 365 days eligible for each recipient.

Table 12-continued

Annualized number of PACE prescription claims by recipient demographics

Demographics	Mean number of claims (SD)	Total number of claims	Percent of total
Income ($)			
0-2,500	26.79 (23.61)	524,650	4.64
2,501-5,000	26.54 (22.80)	1,155,733	10.22
5,001-7,500	27.62 (23.17)	3,479,169	30.75
7,501-10,000	27.11 (22.96)	2,806,677	24.81
10,001-12,500	26.94 (23.59)	2,058,081	18.19
12,500-15,000	26.07 (22.83)	1,235,048	10.92
Unknown	27.99 (23.90)	54,531	.48

NOTE: The number of PACE prescription claims are annualized to 365 days eligible for each recipient.

Table 13

Annualized usual and customary charge
by recipient demographics

Demographics	Mean amount billed (SD)	Total amount billed	Percent of total
Race			
White	551.80 (553.39)	210,334,672	91.83
Black	501.26 (484.04)	12,378,700	5.40
Am. Indian	526.51 (537.49)	1,054,071	0.46
Hispanic	493.70 (490.94)	249,810	0.11
Asian	451.58 (438.15)	156,696	0.07
Other races	445.90 (354.48)	28,537	0.01
Unknown	506.29 (518.53)	4,833,590	2.10
Gender			
Female	552.35 (538.70)	170,033,512	74.24
Male	533.93 (575.35)	59,002,567	25.76
Marital status			
Widow	558.69 (540.73)	130,085,485	56.80
Married	540.62 (575.46)	67,246,664	29.36
Single	504.95 (505.39)	21,131,140	9.23
Divorced	540.78 (544.54)	7,145,367	3.12
Married, Liv. Sep.	566.77 (567.61)	3,426,705	1.50
Unknown	239.83 (123.72)	719	0.00

Table 13-continued

Annualized usual and customary charge
by recipient demographics

Demographics	Amount billed (SD)	Total amount billed	Percent of total
Type residence			
Private home	537.70 (543.57)	170,851,768	74.60
Apartment	579.50 (559.23)	23,114,662	10.09
Nursing home	654.18 (625.50)	9,339,721	4.08
Boarding home	602.60 (575.35)	3,341,428	1.46
Other	552.69 (545.94)	19,387,716	8.46
Unknown	516.6 (499.96)	3,000,783	1.31
Age			
65-70	547.74 (599.56)	55,622,208	24.29
71-75	552.94 (549.74)	57,977,085	25.31
76-80	558.39 (536.80)	53,990,390	23.57
81-85	552.11 (526.93)	36,896,569	16.11
86-90	525.95 (494.31)	17,800,889	7.77
91-95	472.58 (455.04)	5,716,273	2.50
96-100	414.41 (409.74)	861,134	0.38
Unknown	426.69 (413.40)	171,528	0.07

Table 13-continued

Annualized usual and customary charge
by recipient demographics

Demographics	Amount billed (SD)	Total amount billed	Percent of total
Income ($)			
0-2,500	535.35 (540.58)	10,483,825	4.58
2,501-5,000	527.92 (525.87)	22,985,180	10.04
5,001-7,500	551.75 (534.63)	69,509,834	30.35
7,501-10,000	547.68 (539.33)	56,694,036	24.75
10,001-12,500	554.08 (581.67)	42,332,339	18.48
12,500-15,000	546.51 (571.71)	25,890,954	11.30
Unknown	585.68 (599.18)	1,140,911	0.50

Table 14

Comparison of annualized usual and customary charge and annualized number of claims by recipient demographics

Demographics	Percent of Population	Percent of Amt. Billed	Percent of No. of Claims
Race			
White	88.13	91.83	91.91
Black	5.71	5.40	5.31
Am. Indian	0.46	0.46	0.46
Hispanic	0.12	0.11	0.10
Asian	0.08	0.07	0.07
Other races	0.01	0.01	0.01
Unknown	5.48	2.10	2.13
Gender			
Female	73.58	74.24	75.04
Male	26.42	25.76	24.96
Marital status			
Widow	53.83	56.80	57.57
Married	28.77	29.36	28.58
Single	9.68	9.23	9.31
Divorced	3.05	3.12	3.08
Married, Liv. Sep.	1.39	1.50	1.47
Unknown	3.26	0.00	0.00

Table 14-continued

Comparison of annualized usual and customary charge and annualized number of claims by recipient demographics

Demographics	Percent of Population	Percent of Amt. Billed	Percent of No. of Claims
Type residence			
Private home	75.95	74.60	74.02
Apartment	9.53	10.09	10.06
Nursing home	3.41	4.08	4.53
Boarding home	1.33	1.46	1.53
Other	8.39	8.46	8.53
Unknown	1.39	1.31	1.33
Age			
65-70	24.27	24.12	23.32
71-75	25.06	25.31	24.86
76-80	23.11	23.57	23.56
81-85	15.97	16.11	16.55
86-90	8.09	7.77	8.26
91-95	2.89	2.50	2.78
96-100	0.50	0.38	0.44
Unknown	0.10	0.07	0.09

Table 14-continued

Comparison of annualized usual and customary charge and annualized number of claims by recipient demographics

Demographics	Percent of Population	Percent of Amt. Billed	Percent of No. of Claims
Income ($)			
0-2,500	4.54	4.58	4.64
2,501-5,000	10.07	10.04	10.22
5,001-7,500	29.13	30.35	30.75
7,501-10,000	23.93	24.75	24.81
10,001-12,500	18.26	16.50	16.26
12,500-15,000	11.32	8.06	7.82
Unknown	0.47	5.51	5.30

Table 15

Mean annualized number of claims per recipient and annualized usual and customary charge per recipient and per prescription claim by major therapeutic category: Fiscal year 1987-1988

Therapeutic Category	Usual and Customary	Number of Claims	Per Prescription
Antibiotics	21.12 (SD=75.30)	1.07 (SD=2.31)	17.62 (SD=17.38)
Central Nervous System Agents	139.22 (SD=235.15)	6.28 (SD=9.35)	21.35 (SD=12.33)
Cardiovascular Agents	229.92 (SD=316.04)	11.87 (SD=13.54)	18.38 (SD=9.29)
Hormones and Enzymes	36.87 (SD=96.32)	2.39 (SD=4.89)	14.72 (SD=10.01)
Blood Form., Coag., and Vitamins	3.78 (SD=23.96)	0.32 (SD=1.68)	12.00 (SD=8.07)
Gastrointestinal Agents	52.88 (SD=152.04)	1.41 (SD=3.64)	34.33 (SD=19.58)
Miscellaneous Anti-infectives	6.00 (SD=35.73)	0.31 (SD=1.43)	17.51 (SD=10.69)
Miscellaneous Agents	48.54 (SD=127.83)	2.71 (SD=5.14)	16.04 (SD=12.11)

NOTE: PACE study population equalled 418,341.

Table 16

Mean annualized number of claims per recipient and annualized usual and customary charge per recipient and per prescription claim by specific therapeutic category: Fiscal year 1987-1988

Therapeutic Category	Usual and Customary	Number of Claims	Per Prescription
Antibiotics			
Cephalosporins	$8.80 (SD=49.81)	0.25 (SD=1.02)	$33.53 (SD=22.95)
Central Nervous System Agents			
Analgesics and Antipyretics	20.35 (SD=78.04)	1.06 (SD=3.35)	16.59 (SD=11.09)
Non-steroidal Anti-Inflammatory Agents	44.36 (SD=117.19)	1.32 (SD=3.06)	30.78 (SD=16.01)
Sedatives and Hypnotics	8.39 (SD=38.85)	0.61 (SD=2.43)	13.39 (SD=6.03)
Tranquilizers	32.56 (SD=91.57)	1.62 (SD=3.85)	18.71 (SD=10.85)
Autonomic Drugs	15.71 (SD=85.52)	0.79 (SD=3.35)	18.14 (SD=11.91)
Antidepressants	7.78 (SD=44.21)	0.43 (SD=2.06)	16.70 (SD=10.83)
Cardiovascular Agents			
Cardiac Glycosides & Antiarrhythmics	15.26 (SD=81.21)	0.77 (SD=2.82)	17.89 (SD=16.79)
Hypotensives	26.58 (SD=80.48)	1.36 (SD=3.58)	19.09 (SD=9.31)
Diuretics	25.94 (SD=51.06)	2.54 (SD=4.39)	9.81 (SD=4.41)

NOTE: PACE study population equalled 418,341.

Table 16-continued

Mean annualized number of claims per recipient and annualized usual and customary charge per recipient and per prescription claim by specific therapeutic category: Fiscal year 1987-1988

Therapeutic Category	Usual and Customary	Number of Claims	Per Prescription
Cardiovascular Agents (cont.)			
Vasodilators	$25.23 (SD=91.53)	1.10 (SD=3.65)	$21.68 (SD=11.86)
Calcium Channel Blockers	40.55 (SD=123.33)	1.23 (SD=3.45)	31.84 (SD=10.81)
ACE Inhibitors	18.88 (SD=80.49)	0.63 (SD=2.41)	28.26 (SD=12.08)
Antilipemics	5.77 (SD=54.03)	0.15 (SD=1.33)	38.78 (SD=16.61)
Beta Blockers	29.15 (SD=75.51)	1.52 (SD=3.62)	19.38 (SD=7.90)
Potassium Supplements	12.73 (SD=40.25)	1.14 (SD=3.16)	10.87 (SD=5.46)
Hormones and Enzymes			
Adrenal Cortical Hormones	6.11 (SD=28.84)	0.42 (SD=1.63)	14.00 (SD=7.17)
Thyroid and Anti-Thyroid Preps.	2.88 (SD=32.34)	0.37 (SD=1.87)	7.95 (SD=15.74)
Antidiabetic Agents	25.05 (SD=80.25)	1.42 (SD=3.95)	17.06 (SD=8.91)

NOTE: PACE study population equalled 418,341.

Table 16-continued

Mean annualized number of claims per recipient and annualized usual and customary charge per recipient and per prescription claim by specific therapeutic category: Fiscal year 1987-1988

Therapeutic Category	Usual and Customary	Number of Claims	Per Prescription
Gastrointestinal Agents			
Anti-ulcer Agents	$45.89 (SD=142.91)	0.98 (SD=2.92)	$46.20 (SD=16.08)
Miscellaneous Agents			
Eye, Ear, Nose, and Throat Agemts	5.76 (SD=37.39)	0.35 (SD=1.95)	14.98 (SD=7.24)
Spasmolytics	9.72 (SD=39.16)	0.69 (SD=2.51)	13.51 (SD=6.21)
Cough & Expectorant Preparations	3.08 (SD=15.22)	0.29 (SD=1.16)	10.24 (SD=4.40)
Topical Cortico-Steroids	5.48 (SD=32.86)	0.32 (SD=1.52)	15.64 (SD=8.17)
Antihistamines	4.44 (SD=26.98)	0.25 (SD=1.23)	15.87 (SD=9.13)

NOTE: PACE study population equalled 418,341.

Table 17

Number of PACE recipients with specific drug/drug interactions by significance

Drug/Drug Interaction	Number	Percent	Incidence[1]
Total[2]	228,945	100.0	...
Significant[3]			
Total[2]	59,593	26.0	...
ACE Inhibitors/Potassium Salts	10,606	4.6	25.4
Beta Blockers/Diltiazem	6,607	2.9	15.8
Beta Blockers/Digitalis	3,267	1.4	7.8
Beta Blockers/Verapamil	3,074	1.3	7.3
Beta Blockers/Theophylline	3,044	1.3	7.3
Oral Hypoglycemics/Phenothiazines	2,753	1.2	6.6
Digitalis/Diltiazem	2,468	1.1	5.9
Benzodiazepines/Phenytoin	2,049	0.9	4.9
Thyroid/Tricyclic Antidepressants	2,030	0.9	4.9
NSAID's/Oral Anticoagulants	1,960	0.9	4.7
Beta Blockers/Clonidine	1,944	0.8	4.6
Beta Blockers/Isoproterenol	1,858	0.8	4.4
Digitalis/Verapamil	1,814	0.8	4.3
Oral Anticoagulants/Propoxyphene	1,811	0.8	4.3
Digitalis/Quinidine	1,470	0.6	3.5
Potassium Salts/Spironolactone	1,297	0.6	3.1
Quinolones/Theophylline	930	0.4	2.2
Phenytoin/Sulfonamides	865	0.4	2.1
Oral Anticoagulants/Thyroid	749	0.3	1.8
Anticholinergics/Metoclopramide	667	0.3	1.6

[1]Incidence per 1000 persons.
[2]Totals includes some recipients more than once.
[3]Drug/Drug interactions which are termed clinically important and notification of the prescriber regarding the potential DDI is suggested.

Table 17-continued

Number of PACE recipients with specific drug/drug interactions by significance

Drug/Drug Interaction	Number	Percent	Incidence[1]
Moderately significant[2]			
Total[3]	169,352	74.0	...
NSAID's/Thiazides	32,334	14.1	77.3
Oral Hypoglycemics/Thiazides	14,042	6.1	33.6
Digitalis/Furosemide	10,989	4.8	26.3
ACE Inhibitors/NSAID's	9,202	4.0	22.0
Beta Blockers/Oral Hypoglycemics	8,243	3.6	19.7
Benzodiazepines/Cimetidine	8,081	3.5	19.3
Corticosteroids/Theophylline	5,929	2.6	14.2
Digitalis/Thiazides	5,314	2.3	12.7
Beta Blockers/Cimetidine	4,083	1.8	9.8
Corticosteroids/Thiazides	4,081	1.8	9.8
Erythromycin/Theophylline	3,917	1.7	9.4
Corticosteroids/Furosemide	3,514	1.5	8.4
Beta Blockers/Phenothiazines	3,435	1.5	8.2
Phenothiazines/Tricyclic Antidepressants	3,207	1.4	7.7
Oral Hypoglycemics/Sulfonamides	3,197	1.4	7.6
Beta Blockers/Anticholinergics	3,170	1.4	7.6
Tetracycline/Theophylline	2,574	1.1	6.2
Cimetidine/Theophylline	2,312	1.0	5.5
Digitalis/Sulfonamides	2,155	0.9	5.2
Anticholinergics/Tricyclic Antidepress.	2,065	0.9	4.9

[1]Incidence per 1000 persons.
[2]Drug/Drug interactions which signify a somewhat threatening clinical situation and notification of the prescriber might be considered.
[3]Total includes some recipients more than once.

Table 18

Drugs most frequently involved in drug/drug interactions

Drug	Number	Percent
Total	457,900	100.0
Thiazides	55,859	12.2
NSAID'S	44,384	9.7
Beta Blockers	38,977	8.5
Oral Hypoglycemics	36,788	8.0
Digitalis Glycosides	29,532	6.4
ACE Inhibitors	22,083	4.8
Cimetidine	19,892	4.3
Theophylline	19,841	4.3
Corticosteroids	17,616	3.8
Furosemide	14,971	3.3
Phenothiazines	13,047	2.8
Tricyclic Antidepressants	12,684	2.8
Potassium Salts	12,313	2.7
Benzodiazepines	11,942	2.6
Oral Anticoagulants	11,670	2.5
Anticholinergics	9,119	2.0
Diltiazem	9,118	2.0
Phenytoin	7,656	1.7
Sulfonamides	7,259	1.6
Metoclopramide	5,025	1.1

Table 19

Number of specific drug/drug interactions by significance

Drug/Drug Interaction	Number	Percent	Incidence[1]
Total	1,297,696	100.0	...
Significant[2]			
Total	355,496	27.4	31.9
ACE Inhibitors/Potassium Salts	76,024	5.9	6.8
Beta Blockers/Diltiazem	52,750	4.1	4.7
Beta Blockers/Digitalis	21,597	1.7	1.9
Beta Blockers/Theophylline	17,468	1.3	1.6
Beta Blockers/Verapamil	16,750	1.3	1.5
Digitalis/Diltiazem	16,178	1.2	1.5
Beta Blockers/Clonidine	14,611	1.1	1.3
Thyroid/Tricyclic Antidepressants	14,516	1.1	1.3
Benzodiazepines/Phenytoin	14,121	1.1	1.3
Digitalis/Verapamil	11,018	0.8	1.0
Oral Hypoglycemics/Phenothiazines	9,141	0.7	0.8
Digitalis/Quinidine	8,744	0.7	0.8
NSAID's/Oral Anticoagulants	7,878	0.6	0.7
Potassium Salts/Spironolactone	7,190	0.6	0.6
Beta Blockers/Isoproterenol	7,098	0.5	0.6
Oral Anticoagulants/Propoxyphene	5,979	0.5	0.5
Oral Anticoagulants/Thyroid	5,380	0.4	0.5
Oral Anticoagulants/Phenytoin	4,096	0.3	0.4
ACE Inhibitors/Spironolactone	3,322	0.3	0.3
Levodopa/Phenothiazines	3,239	0.2	0.3

[1]Incidence per 1000 prescriptions (n=11,133,290).
[2]Drug/Drug interactions which are termed clinically important and notification of the prescriber regarding the potential DDI is suggested.

NOTE: Each recipient may have more than one of the same interaction during the study period and these duplicates are included in the number reported.

Table 19-continued

Number of specific drug/drug interactions by significance

Drug/Drug Interaction	Number	Percent	Incidence[1]
Moderately significant[2]			
Total	942,200	72.6	84.6
NSAID's/Thiazides	175,762	13.5	15.8
Oral Hypoglycemics/Thiazides	131,331	10.1	11.8
Beta Blockers/Oral Hypoglycemics	78,283	6.0	7.0
Digitalis/Furosemide	69,222	5.3	6.2
ACE Inhibitors/NSAID's	45,722	3.5	4.1
Benzodiazepines/Cimetidine	42,832	3.3	3.8
Digitalis/Thiazides	33,404	2.6	3.0
Corticosteroids/Theophylline	29,942	2.3	2.7
Beta Blockers/Cimetidine	22,832	1.8	2.0
Phenothiazines/Tricyclic Antidepressants	18,435	1.4	1.7
Clonidine/Oral Hypoglycemics	14,793	1.1	1.3
Benzodiazepines/Levodopa	14,743	1.1	1.3
Allopurinol/Oral Hypoglycemics	14,371	1.1	1.3
Beta Blockers/Phenothiazines	14,307	1.1	1.3
Beta Blockers/Anticholinergics	13,125	1.0	1.2
Corticosteroids/Thiazides	12,518	1.0	1.1
Corticosteroids/Furosemide	12,168	0.9	1.1
Oral Anticoagulants/Oral Hypoglycemics	12,122	0.9	1.1
Cimetidine/Theophylline	11,682	0.9	1.1
Anticholinergics/Phenothiazines	10,687	0.8	1.0

[1]Incidence per 1000 prescriptions (n=11,133,290).
[2]Drug/Drug interactions which signify a somewhat threatening clinical situation and notification of the prescriber might be considered.

NOTE: Each recipient may have more than one of the same interaction during the study period and these duplicates are included in the number reported.

Table 20

PACE Recipients with at least one drug/drug interaction, by the ten most frequent significant interactions and race.

Drug/Drug Interaction	Number of Recipients	Percent of Recipients			
		White	Black	Other	Unknown
Total Recipients	418,341	91.1%	5.9%	0.7%	2.3%
All Interactions	228,945	91.1	6.0	0.7	2.2
ACE Inhibitors/Potassium Salts	10,606	89.6	7.8	0.6	2.0
Beta Blockers/Diltiazem	6,605	92.0	5.4	0.7	1.9
Beta Blockers/Digitalis	3,267	91.4	5.9	0.5	2.2
Beta Blockers/Verapamil	3,074	90.5	6.6	0.7	2.2
Beta Blockers/Theophylline	3,044	91.1	6.1	0.6	2.2
Oral Hypoglycemics/Phenothiazines	2,753	92.5	5.2	0.5	1.8
Digitalis/Diltiazem	2,468	90.5	7.3	0.6	1.6
Benzodiazepines/Phenytoin	2,049	93.4	4.2	0.3	2.1
Thyroid/Tricyclic Antidepressants	2,030	95.3	1.7	0.4	2.6
NSAID's/Oral Anticoagulants	1,960	93.7	3.6	0.7	2.0

Table 21

PACE Recipients with at least one drug/drug interaction, by the ten most frequent significant interactions and gender

Drug/Drug Interaction	Number of Recipients	Percent of Recipients	
		Female	Male
Total Recipients	418,341	73.6%	26.4%
All Interactions	228,945	75.5	24.5
ACE Inhibitors/Potassium Salts	10,606	75.5	24.5
Beta Blockers/Diltiazem	6,605	74.0	26.0
Beta Blockers/Digitalis	3,267	79.1	20.9
Beta Blockers/Verapamil	3,074	78.7	21.3
Beta Blockers/Theophylline	3,044	65.0	35.0
Oral Hypoglycemics/Phenothiazines	2,753	77.3	22.7
Digitalis/Diltiazem	2,468	75.2	24.8
Benzodiazepines/Phenytoin	2,049	70.0	30.0
Thyroid/Tricyclic Antidepressants	2,030	92.8	7.2
NSAID's/Oral Anticoagulants	1,960	74.0	26.0

Table 22

PACE Recipients with at least one drug/drug interaction, by the ten most frequent significant interactions and residence site

Drug/Drug Interaction	Number of Recipients	Percent of Recipients				
		Owner	Apartmt	N Home	Other	Unknown
Total Recipients	418,341	76.0%	9.5%	3.4%	9.7%	1.4%
All Interactions	228,945	74.4	9.5	4.5	10.2	1.4
ACE Inhibitors/Potassium Salts	10,606	76.5	8.8	3.3	10.0	1.4
Beta Blockers/Diltiazem	6,605	78.0	10.7	1.1	9.0	1.2
Beta Blockers/Digitalis	3,267	71.6	9.8	6.4	10.9	1.3
Beta Blockers/Verapamil	3,074	76.4	11.9	1.4	9.1	1.2
Beta Blockers/Theophylline	3,044	76.9	10.3	2.2	8.0	1.6
Oral Hypoglycemics/Phenothiazines	2,753	73.8	8.8	5.9	10.3	1.2
Digitalis/Diltiazem	2,468	71.1	9.1	7.0	11.2	1.6
Benzodiazepines/Phenytoin	2,049	66.5	9.6	10.7	11.8	1.4
Thyroid/Tricyclic Antidepressants	2,030	69.0	11.8	6.5	11.7	1.0
NSAID's/Oral Anticoagulants	1,960	76.0	9.4	2.2	10.6	1.8

Table 23

PACE Recipients with at least one drug/drug interaction, by the ten most frequent significant interactions and years of age

Drug/Drug Interaction	Number of Recipients	Percent of Recipients		
		65-75	76-85	Over 85
Total Recipients	418,341	49.3%	39.1%	11.6%
All Interactions	228,945	49.5	40.4	10.1
ACE Inhibitors/Potassium Salts	10,606	44.1	43.3	12.6
Beta Blockers/Diltiazem	6,605	54.1	39.5	6.4
Beta Blockers/Digitalis	3,267	36.6	47.9	15.5
Beta Blockers/Verapamil	3,074	55.1	39.1	5.8
Beta Blockers/Theophylline	3,044	58.2	36.4	5.4
Oral Hypoglycemics/Phenothiazines	2,753	52.1	39.5	8.4
Digitalis/Diltiazem	2,468	34.9	48.9	16.2
Benzodiazepines/Phenytoin	2,049	48.1	41.7	10.2
Thyroid/Tricyclic Antidepressants	2,030	52.9	39.5	7.6
NSAID's/Oral Anticoagulants	1,960	52.9	40.1	7.0

Table 24

Point estimation results

Acceptable Error	Sample size
Number of claims per recipient, σ = 23.15	
0.25	30,348
0.50	8,236
0.75	3,661
1.00	2,058
1.25	1,318
1.50	916
Usual and customary charges per person, σ = 548.68	
5.00	41,146
10.00	11,566
15.00	5,141
20.00	2,892
25.00	1,851
30.00	1,286
Usual and customary charge per claim per person, σ = 19.75	
0.25	5,630
0.50	1,408
0.75	626
1.00	326
1.25	225
1.50	156

NOTE: For all calculations, $\alpha = 0.05$, $Z = \pm 1.96$